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Abstract

This study estimates the impacts of formal home care provided by paid professionals on spousal health outcomes. We use data from the Survey of Health, Ageing, and Retirement in Europe, a panel of older adults living in several European countries, and match new formal home care users to non-users to account for the endogeneity of the decision to seek formal home care. After considering underlying mechanisms, our results suggest that at least in the short run, the use of formal home care does not impact spousal physical or mental health. We also find that formal home care use increases spousal informal caregiving —along the extensive margin—, although in our sample and short time horizon, spousal informal caregiving does not seem to impact health.

Keywords: formal home care, informal care, caregiver burden, spouse caregivers, health index, health shocks, statistical matching

JEL codes: C29, D19, I19

1 Introduction

Population aging is a worldwide phenomenon that poses unique challenges to governments and societies. People aged 65 years and over already represented 19.5% of the European Union population in 2016; a share that is projected to increase to almost 30% by 2050. Dependency rates —measured by prevalence of longstanding limitations in activities because of health problems— vary across countries and increase with age, from as much as 18% in the 65-69 age group to 66% in the 85+ age group in Slovakia (European Commission 2018). The increase in both life expectancy and number of years that people live with varying degree of disability translates into increasing demand for long-term care (LTC) that is provided informally or by paid professionals.[1]

LTC includes services required by people with reduced physical or cognitive capacity, who are dependent on help with activities of daily living, like bathing or taking medication, for a long period of time. Across the OECD, most LTC is provided informally by family members or friends, mostly spouses and adult children (Colombo et al. 2011). LTC can also be provided in people's homes by paid professionals (i.e. formal home care), or in institutions such as nursing homes, day care centers, and assisted living facilities.

Providing informal care may be detrimental to caregivers' health, particularly in the case of spouses, who are typically older and frailer, provide more hours of care, and have fewer resources to cope with the strains of caregiving (Pinquart and Sörensen 2003a). Formal LTC may help alleviate the caregiver burden if it can replace some care activities (fully or partially). Understanding the impacts of different LTC services on the caregiver is crucial to design better policies aiming to reduce the burden of caregiving. This study contributes to informing LTC policymaking by answering the following question: "What are the impacts of formal home care use on spousal health outcomes?"

As there are several (opposing) mechanisms at play (see next section), this is a question that can only be answered empirically, with suitable data and identification strategy. To identify the causal effects of formal home care use on spousal health, we must address the fact that the decision to use formal home care is not random. There are various sources of endogeneity. First, several household characteristics and couple dynamics may be related to both formal home care use and

[1] The COVID-19 pandemic, and in particular "Long COVID" —long-term effects of coronavirus— may also translate into new LTC demand.

spousal health. Examples include health status of the potential care receiver, social network/support from family members inside and outside the household, preferences, and health-related behaviors like smoking or diet. Some of these are usually available in survey data and can be accounted for. Others, such as preferences, are harder to capture (i.e. unobserved confounders). A second important source of endogeneity is reverse causality, as the health status of the (potentially caregiving) spouse influences the use of formal home care. Third and fourth are the so-called "family effect" —the deterioration of the health status of the care recipient causes emotional strain on the spouse—, and selection, which can differ by gender —male caregivers are more likely to institutionalize their spouse, resulting in selection out of samples of community-residing individuals, and more likely to hire formal home help, resulting in selection into "treatment".

Assessing the health of spouse caregivers is particularly important, as they represent the bulk of caregivers and usually, they are older and at higher risk of having physical or mental health problems themselves. We contribute to the so far very limited literature (see next section) by exploring the causal impacts of formal home care use on spousal health. We carefully address the empirical challenges presented above, distinguish between the impacts on physical and mental health, and explore the underlying mechanisms, including the relationship between formal home care use and spousal informal caregiving and the impacts of spousal informal caregiving on health. We also investigate heterogeneity by type of formal home care (personal care vs. domestic help) and between spouses who accumulate or not other caregiving responsibilities (e.g. to elderly parents).

We apply the methodology of Schmitz and Westphal (2015), Stöckel and Bom (2020), and de Zwart et al. (2017). They study the impacts of informal caregiving on health —we adapt their econometric specification to study primarily the impacts of formal home care on spousal health, although like them, we also explore the impacts of spousal informal caregiving on health. Using data from the Survey of Health, Ageing, and Retirement in Europe (SHARE) for almost 20 European countries, we identify new users of formal home care, which we compare to similar couples that never use formal home care using matching techniques. This strategy addresses most sources of endogeneity. To tackle the family effect, we follow Stöckel and Bom (2020) and introduce "health shock" indicators capturing significant drops in health status of the potential care recipient between two waves, that could impact the health of the potentially caregiving spouse. To

explore potentially remaining endogeneity, we also look into shocks to the health of the potentially caregiving spouse between two waves. All analyses are run separately for female and male spouses.

Results suggest no effects of formal home care use on spousal physical or mental health, for men or women, in the short run. A likely explanation is that couples hire formal home care when both spouses' health is declining —at least one spouse starts to need formal help with daily activities, and the other spouse is no longer healthy enough to provide sufficient help. We also find that formal home care use increases the likelihood of spousal informal caregiving. Lastly, in our sample and short time horizon, spousal informal caregiving does not seem to impact health.

The remainder of this text is organized as follows: the next section reviews prior literature and outlines the conceptual background and hypotheses. The following one details the data and methodology. Results are presented in section 4. Section 5 discusses the main findings and concludes.

2 Background and hypotheses

2.1 Informal caregiving and health

Informal caregiving may involve heavy tasks, such as lifting and transferring the care receiver, which may cause physical pain or back problems. There are also important sources of emotional strain, for example from observing the health of a loved one decline —the so-called "family effect", whereby a related caregiver not only cares for but also cares about the care receiver (Bobinac et al. 2010). Informal caregiving may also restrict the caregiver's personal, social, and professional life, mainly if they are not sharing the task with other family members or professional providers, which can have additional negative health implications. The economics literature has documented the negative physical and mental health consequences of providing informal care (see Boom et al. 2019 for a review). For example, Coe and Van Houtven (2009), Do et al. (2015), and Heger (2016) provide evidence of the detrimental impacts of informal caregiving in the case of adult children caring for their elderly parents. Schmitz and Westphal (2015) and Stöckel and Bom (2020) consider both spouse and child caregivers, and de Zwart et al. (2017) and Uccheddu et al.

(2019) focus on spouses; all find negative impacts of informal caregiving, especially on mental health.[2]

Some factors may help mitigate the negative impacts of informal caregiving on health. For example, in retirement, providing informal care is one way for the caregiver to remain active. Informal caregiving can also be a source of positive affect, such as feeling useful and appreciated, being close to the care receiver, and enhanced self-esteem and pride from being able to help (Pinquart and Sörensen 2003b). Whether these positive aspects are enough to compensate for the negative ones depends on the duration and intensity of informal caregiving, as well as the type and severity of the illness or limitations of the care receiver. For example, Zwar et al. (2018) find that providing domestic help, but not personal care, is associated with increased depressive symptoms.

Importantly, identifying the impacts of caregiving on health requires addressing the selection into and out of informal caregiving (see e.g. Coe and Van Houtven 2009). The studies cited above deal with such identification challenges —at least partly— by using fixed-effects models, instrumental variables, or matching strategies.

2.2 Formal home care

Formal home care makes the previous relationships even more complex, as it can substitute for or complement informal caregiving, with additional implications for informal caregivers' health. Formal home care can (partly) substitute for informal care, i.e. replace some of the tasks provided by family members or friends —potentially the most difficult ones— and thus contribute to mitigate the informal caregiver burden. However, in some cases formal home care can signal the severity of the disability to the relatives or require additional support from them. Generally, the literature has found that an increase in informal care decreases utilization of formal home care, suggesting that the two are substitutes (see Bonsang 2009 and references therein). The literature on the reverse relationship —the impact of formal home care on informal caregiving— is more

[2] One possible explanation for finding negative impacts of caregiving mainly on mental health is that these studies consider care recipients living in the community. When the level of care needs becomes significant —e.g. needing help with bathing and transferring— individuals tend to be institutionalized, which means that relatively few caregivers may be conducting very heavy tasks, limiting the ability to find statistically significant impacts of caregiving on physical health.

limited. Perdrix and Roquebert (2019), using French data, find that using more hours of formal home care reduces informal caregiving (i.e. substitutability). However, Carrino et al. (2018), using data for France, Germany, Austria, and Belgium, find evidence of complementarity. The authors interpret this finding in light of substantial unmet LTC needs in European populations (Spasova et al. 2018), whereby it is possible that additional public supply of formal home care leads to greater informal care use, e.g. because formal home care providers identify unmet needs. Both studies address the endogeneity of formal home care with policy-related instrumental variables, namely local-level regulated formal home care prices (Perdrix and Roquebert 2019) and an indicator of eligibility for public home care programs based on self-reported limitations and cross-national variations in needs-based eligibility criteria (Carrino et al. 2018). A few other studies indirectly consider the role of formal LTC in shaping the impact of informal caregiving on health by looking separately at (groups of) countries with different generosity of formal LTC policies (e.g. Brenna and Di Novi 2016, Calvó-Perxas et al. 2021, Di Novi et al. 2015, Kaschowitz and Brandt 2017, Uccheddu et al. 2019).

Besides interacting with informal caregiving, formal home care can impact informal caregivers' health more directly —particularly mental health. On the one hand, formal home care providers can reduce social isolation and even loneliness. On the other hand, formal home care can induce stress, as e.g. some individuals may feel uncomfortable with letting strangers in their house.

The health status of (potential) informal caregivers influences the receipt of formal LTC by the care receiver; that is, selection must also be taken into account in this context. For example, the deterioration of the health of an informal caregiver may lead to the institutionalization of the care receiver or to hiring professional home help. In a Grossman model framework, informal caregivers may invest in formal LTC to reduce their caregiving burden and protect their health.

2.3 The role of gender

Gender also seems to modify the relationship between informal caregiving and health. The literature suggests that women may be more vulnerable to the negative consequences of informal caregiving than men (see e.g. Uccheddu et al. 2019 or Zwar et al. 2020 for a review). For instance, men are more likely to be praised for caring for their spouse; women may tend to feel obligated to care as per "traditional gender roles". Moreover, men are more likely to seek formal home care or

to institutionalize their spouses. When using survey data pertaining to community-dwelling individuals, this may translate into male caregivers having healthier spouses than female caregivers, on average —another source of selection.

2.4 Hypotheses

To summarize, we can put forward three tentative hypotheses. First, the impact of formal home care on physical/mental health of the spouse is ambiguous. Second, the impact of formal home care on physical/mental health of the spouse differs by gender of the spouse. Third, the impact of formal home care on physical/mental health of the spouse differs by type of formal home care (personal care or domestic help).

In addition to estimating the impacts of formal home care on spousal health, we explore the underlying mechanisms, including the impacts of formal home care on spousal informal caregiving, and the impacts of spousal informal caregiving on physical/mental health. We conduct all analyses by gender of the spouse and consider heterogeneous effects by type of formal home care. Due to data limitations, we do not consider differential impacts by duration or intensity of formal home care utilization.

2.5 Related literature

To our knowledge, only one study has explored the impacts of formal home care use on informal caregivers' health, by Juin (2019), who considers non-coresiding adult children caring for their parents and uses an instrumental variable to deal with endogeneity: the proportion of elderly receiving a subsidy for formal home care in each region in France. The author finds that an increase in formal home care hours reduces the probability that informal caregiving affects health, suggesting that improving access to formal home care could protect the health of child caregivers.

Two related studies are also worth mentioning: Wagner and Brandt (2018) find a positive association between formal LTC availability at the regional level, measured by the number of nursing home beds, and spouse caregivers' wellbeing, measured in terms of life satisfaction, loneliness, and depression. One possible interpretation of this finding is that knowing that there is an alternative setting of care provides spouse caregivers with some reassurance that their loved

ones will be taken care of, if need be. Dong et al. (2019) compare spouses of individuals receiving formal home care with spouses of individuals living in nursing homes and find that the first have worse physical health (possibly because of implicit informal caregiving responsibilities), but better mental health (possibly because they continue to live with their loved ones).

3 Data and methodology

3.1 Data source

This study uses SHARE data (share-project.org). SHARE is a multidisciplinary, cross-national panel database that includes representative samples of individuals 50 years and older and their partners irrespective of age, in 28 European countries and Israel. The survey is conducted every two years since 2004. At the time of this study, the latest data pertained to the year 2017 (Wave 7).

3.2 Sample selection

Couple identifiers in the dataset allow matching both members of a couple. So first, we keep complete couples. Second, we identify individuals that report any limitation in the activities of daily living (ADL, e.g. dressing) or the instrumental activities of daily living (IADL, e.g. taking medications), expected to last longer than three months, in a given wave. The goal is to identify LTC needs and not temporary needs following, for example, an acute health shock. The question on formal home care use refers to any utilization in the past year (see section 3.3), which means it could capture temporary users (i.e. post-acute care rather than LTC).

Individuals that report limitations are considered potential care receivers —they potentially need either formal or informal help with the ADL (i.e. personal care) or IADL (i.e. domestic help). The health status of their spouses (the potential informal caregivers) is the outcome of interest in this study (see also Figure 1). This lax definition of (potential) informal caregiving is to account for the fact that an individual living under the same roof as someone who has limitations in their daily activities is likely to help them in some way, even without realizing it. More importantly, whether a particular individual considers that they provide informal care to their partner or not depends on what they consider to be “normal chores” or even “their duty as a spouse” —this is subjective and

varies across cultures, gender, and generations. This implies that information on informal care provision to spouses based on questions such as "In the past year, did you provide informal help to your spouse?" may not be comparable across individuals.[3] Nevertheless, we conduct complementary analyses looking at the subsample of spouses who say they provide informal care to their partner.[4] Please see Appendix A.1 for more details on the sample selection.

3.3 Formal home care use

We construct an indicator that captures whether the "potential care receiver" (i.e. individual who needs help with the (I/)ADL) obtained formal help with personal care or with domestic tasks. In complementary analyses, we look separately at the utilization of formal personal care and domestic help. We only consider whether the individual uses formal home care at all, because unfortunately, the duration and intensity of use is only asked in waves 1, 2, and 7, which does not provide us with enough observations (Appendix A.2).

Figure 1 illustrates which member of the couple provides what information for the analyses. "Treatment status" is formal home care use by the potentially care receiving spouse, the one that reports limitations.

[3] This limitation may be less apparent when looking at informal care provided by adult children living in different households, for example. See also Urwin et al. (2021), who document (1) discrepancies between caregiver and care reciever reports of informal care, (2) caregiver under reporting of caregiving, and (3) that (I/)ADL limitations strongly predict agreement in caregiver and care receiver reports of informal care.

[4] The information for identifying these individuals comes from the question "*Is there someone living in this household whom you have helped regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing? Who is that?"*

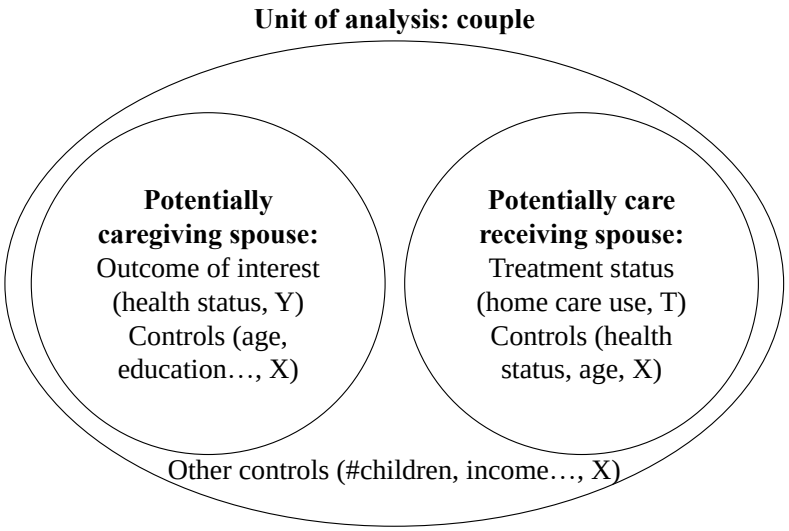


Figure 1. Sources of information for the analyses

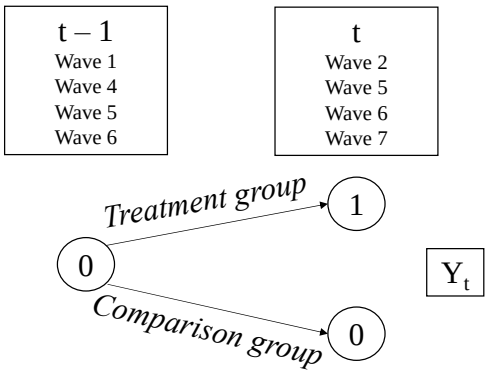
3.4 Health

Similarly to prior literature, we look separately at physical and mental health, as the impacts of formal home care may differ. Physical health is measured by a continuous standardized health index that we compute as explained in Appendix B. Mental health is captured by the EURO-D scale (Prince et al. 1999), which we invert so that higher values denote better health, like is the case with the health index. So, our mental health variable ranges from 0 (very depressed) to 12 (not depressed). We measure physical and mental health of the potentially care receiving spouse (control variables) in the same manner (Figure 1).

3.5 Empirical strategy

Following Schmitz and Westphal (2015), Stöckel and Bom (2020), and de Zwart et al. (2017), we define a "treatment group" of couples not using formal home care initially but that start to at some point between two waves. Couples that never report formal home care use in any wave constitute the "comparison group". Couples in the two groups are matched on baseline characteristics, i.e. in the wave before treatment group couples started to use formal home care. This strategy, illustrated in Figure 2, presents three crucial advantages. First, formal home care use (i.e. treatment status) cannot affect the covariates, which are measured in the past. Second, we can account for previous

spousal health status by including the lags of the dependent variables in the estimation of the propensity score, (partly) addressing the selection issue. That is, we compare potentially caregiving spouses with the same health status before treatment, to rule out that spouses in the treatment group are in worse health because they were too unhealthy in the first place to provide informal care to their partner, so they hired formal home care. Third, previous spousal health status also captures most of the unobserved confounders, because time-invariant confounders will already have affected the outcome in the past.[5]



0 – Not using formal home care; 1 – Using formal home care

Figure 2. Matching design

We follow closely de Zwart et al. (2017), who also use SHARE data, to select the matching variables. Those variables are health status of the potentially caregiving spouse, Y_{t-1} (both physical and mental health), age and age squared, number of children and household size (to capture other potential sources of informal help), education according to the ISCED-97 classification[6] (regrouped into ISCED 1/2, ISCED 3/4, ISCED 5/6, vs. None/other), log of household income,

[5] Due to varying country participation, waves dedicated to life history questionnaires, and attrition (see also Appendix A), with SHARE data it is not possible to estimate dynamic panel data models to address endogeneity, like for example Coe and Van Houtven (2009) do.

[6] See Table 1 in http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en_0.pdf.

square root of household wealth[7] (including a binary indicator to capture negative wealth), employment status (employed or self-employed, permanently sick or disabled, vs. retired/unemployed/homemaker/other), participation in charitable activities or voluntary work (proxy for personality or willingness/ability to provide informal care), providing help to someone else outside the household (e.g. elderly parents), health status of the potentially care receiving spouse (both physical and mental health), age of the care receiving spouse, country and wave fixed effects, all included in X_{t-1}. All matching variables are measured in $t-1$, the wave before the couple starts to use formal home care.

We estimate the propensity to use formal home care in t using a probit model and kernel matching, preferable to for example nearest-neighbor matching given the large number of matching characteristics.[8] We assess the common support and whether balance of covariates is achieved after matching. Finally, the average treatment effect on the treated is estimated by regressing spousal health in t on formal home care use in t and all covariates used in the propensity score estimation, restricting the sample to the common support region and using the kernel weights from the matching procedure as probability weights. Standard errors are clustered at the couple level to account for multiple observations over time.

The strategy described thus far may still not be enough to (1) completely rule out the family effect, and (2) fully address reverse causality. As the survey is conducted with a time interval of about two years, there is room for important health changes of both spouses, so accounting for baseline health may not be enough. Regarding (1), important health changes of the potentially care receiving spouse since $t-1$ may impact both treatment status and spousal health in t (i.e. family effect). In our main analyses, we follow Stöckel and Bom (2020) and address this concern by including two additional matching variables: binary indicators capturing physical and mental health shocks to the health of the potential care receiver since $t-1$. Health shocks are defined as drops of at least one standard deviation in the physical/mental health variables.

[7] We use the square root to take care of skewness instead of the natural logarithm like for income, because wealth can be negative. This way, we replace negative wealth with zeros, and then include a dummy variable to flag such situations. Also, we deal with the higher numbers of missing values for income and wealth by using the imputations provided in the SHARE database.

[8] The bandwidth is set at 0.04, leaving few treatment observations unmatched. The results are not sensitive to changing the bandwidth (see the Results section).

Regarding (2), important health changes of the potentially caregiving spouse since $t-1$ may also impact both treatment status and their health in t (i.e. remaining reverse causality). We explore shocks to the physical/mental health of potentially caregiving spouses in complementary analyses, to explore the extent of this potentially remaining endogeneity.[9]

Lastly, all analyses are conducted separately by gender of the potentially caregiving spouse, for two reasons. First, the impact of formal home care use is likely to differ for female and male informal caregivers, as discussed in section 2.3. Second, it is a way of guaranteeing that the Stable Unit Treatment Value Assumption (SUTVA), which in this case implies that the health status of a potential informal caregiver in a given couple does not depend on the treatment status of another couple, holds. According to our sample selection criteria (section 3.2), it is possible that both individuals in a given couple report limitations in the (I/)ADL. In such cases, the couple would enter twice in the analyses, as both spouses would be considered as potential care receivers as well as potential caregivers, resulting in a violation of the SUTVA (the health of caregiver i would depend on the treatment status of caregiver j). The alternative to looking separately at female and male caregivers would be to arbitrarily drop one of the observations when the same couple appears twice, losing some information.[10]

4 Results

4.1 Summary statistics

Although there are more than 10,000 observations in the dataset that verify the selection criteria (section 3.2), we lose many observations in the matching procedure. This happens because the covariates are measured in the previous wave. As explained in Appendix A, there are important gaps in the data due to inconsistent country participation and the fact that wave 3 and in some countries, wave 7, were dedicated to collecting respondents' life histories. So, waves 1, 4, and to a large extent, wave 5, only provide information for matching (as we only have three countries in wave 4). Coupled with attrition and, to a limited extent, missing values in the use variables, this

[9] We do not include such shocks in the main specification because they may themselves be the result of formal home care use, so they might absorb a significant part of the effect that we want to capture.
[10] Looking separately at female and male caregivers works because there are almost no same-sex couples.

leaves only about 1,700 observations of female spouses and 1,500 observations of male spouses for the analyses.

Summary statistics by treatment status are shown in Appendix C. About 13.5% of the couples where the potentially caregiving spouse is female use formal home care (16.5% when the potential caregiver is male). Potentially caregiving spouses in households that use formal home care have worse health status and are about 5 years older, on average, compared with potentially caregiving spouses in non-using households. In using households, both spouses are more likely to have suffered a physical health shock since the previous wave, and potentially caregiving spouses, but not care receivers, in using households are more likely to have experienced a mental health shock. Formal home care users and non-users also differ in several other aspects, such as employment status of the potentially caregiving spouse and health status of the potential care receiver in the previous wave, which illustrates the need to make the two groups more comparable.

4.2 Propensity to use formal home care and matching quality

The results of the probit models used to estimate the propensity to use formal home care are shown in Appendix D (Table D1). Worse physical health of the potential care receiver in $t-1$ and shocks to physical health of the potential care receiver since $t-1$ are both associated with higher likelihood of using formal home care in t. Intriguingly, in the case of mental health of the potential care receiver (at baseline or shocks since $t-1$), the relationship is the opposite and only significant when the potentially caregiving spouse is a woman. Other statistically significant variables ($p<0.05$) are the care receiver's age (coef.>0), and when the potential informal caregiver is a man, income (coef.>0). The likelihood of formal home care use also varies across countries. Lagged health of the potentially caregiving spouse does not explain formal home care use, which suggests that selection into treatment (at baseline) may play a limited role in this sample.

The matching procedure virtually eliminates average differences in observable characteristics between treatment and comparison groups, i.e. the two groups are balanced after matching (Tables D2 and D3). With the bandwidth set at 0.04, one (ten) treatment observations in the men (women) sample fall outside the common support region, with propensity scores too high to be reliably matched to untreated individuals. Increasing the bandwidth up to 0.1 did not solve this.

4.3 Impacts of formal home care use on spousal health

Our baseline econometric specification gives detrimental impacts of formal home care use on spousal health (Table 1). On average, formal home care use significantly decreases the physical health of potentially caregiving women by about 0.2 standard deviations ($p<0.01$) and the mental health of potentially caregiving men by 0.3 points (the scale goes from zero —very depressed— to 12 —not depressed; $p<0.1$).[11]

The bottom half of Table 1 shows the impacts of formal home care use when looking at the subsample of self-reported informal caregivers (i.e. spouses who explicitly say that they provide personal care to their partner). The negative effect on physical health for women disappears. The detrimental impact on mental health for men is larger than in the baseline sample and strongly significant, at roughly -0.7 points in the mental health scale ($p<0.01$).

The full results of the estimations on the baseline sample are shown in Appendix E. Better health in $t-1$ is associated with better health in t. Witnessing shocks to the physical health of the care receiving partner impacts negatively on women's mental health. Health of the care receiving partner in $t-1$ appears broadly unrelated to spousal health in t.

[11] The interpretation of changes in physical health in standard deviations is not 100% accurate because the values of the health index were standardized based on a larger sample (see Appendix B).

Table 1. Impacts of formal home care use on spousal health, by gender of the (potential) caregiver

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
a) Baseline: spouses of individuals with limitations (potential informal caregivers)				
Home care use (t)	-0.18092***	-0.22724	-0.06705	-0.30469*
	(0.06861)	(0.15064)	(0.06625)	(0.16192)
R-squared	0.555	0.383	0.531	0.328
Number of observations	1,702	1,735	1,498	1,503
Number of couples	1,609	1,641	1,411	1,412
b) Self-reported informal caregivers				
Home care use (t)	0.01552	-0.25737	-0.09567	-0.71506***
	(0.07167)	(0.20817)	(0.10812)	(0.25341)
R-squared	0.655	0.437	0.518	0.398
Number of observations	705	719	531	525
Number of couples	690	704	523	517

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed.

We also explore separately the impacts of each type of formal home care: personal care and domestic help. We find that the previous results, for both types of formal home care combined, are driven by the results for domestic help (Table 2).

Table 2. Impacts of formal home care use on spousal health: personal care vs. domestic help

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
Professional personal care (t)	-0.08156	-0.12382	0.01235	-0.28778
	(0.06888)	(0.16981)	(0.08771)	(0.18778)
R-squared	0.632	0.402	0.551	0.387
Number of observations	1,800	1,834	1,698	1,700
Number of couples	1,694	1,726	1,562	1,560
Professional domestic help (t)	-0.24206***	-0.49027***	-0.07516	-0.44428***
	(0.07892)	(0.17988)	(0.06740)	(0.16670)
R-squared	0.577	0.370	0.522	0.326
Number of observations	1,800	1,826	1,562	1,570
Number of couples	1,687	1,712	1,460	1,465

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed.

As some individuals accumulate the responsibility of caring for someone else outside the household, such as an elderly parent, we also explore potentially heterogeneous effects between spouses who have such an extra responsibility and those who don't. These results are reported in Table 3. We find that the overall detrimental impacts of formal home care are driven by individuals who do not provide informal care outside the household. One limitation of these analyses is that providing care outside the household is also an endogenous decision.

Table 3. Impacts of formal home care use on spouses who care for someone else outside the household vs. spouses who don't

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
a) Caregiving outside the household				
Home care use (t)	-0.10848	-0.08046	0.11512	-0.20119
	(0.09855)	(0.27674)	(0.08376)	(0.28519)
R-squared	0.695	0.534	0.600	0.392
Number of observations	448	455	409	403
Number of couples	433	440	395	389
b) No caregiving outside the household				
Home care use (t)	-0.19793***	-0.31787*	-0.12138	-0.29769
	(0.07652)	(0.17038)	(0.08342)	(0.19940)
R-squared	0.552	0.427	0.535	0.354
Number of observations	1,188	1,214	1,029	1,039
Number of couples	1,143	1,169	984	990

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed.

There are three possible explanations for the results presented so far. The first is that formal home care and spousal informal caregiving are complements, and spousal informal caregiving is detrimental for health as found in previous literature (section 2). We explore this in the next section. Also, we find that formal home care use only impacts negatively the health of women who do not provide informal care outside the household. The lack of a detrimental impact for those who care for example for an elderly parent outside the household may be related to the fact that those are the women with the greater potential to benefit from some respite.

The second possible (non-competing) explanation is that receipt of formal home care, particularly domestic help, directly and negatively impacts spousal health (section 2). Possibly, some spouses (especially women) feel that they should be able to handle the domestic chores (but not necessarily the ones related to personal care), such that receiving formal domestic help hurts their pride (see e.g. Uccheddu et al. 2019). Some people (more often men) derive positive feelings from informal caregiving, e.g. sense of usefulness and self-esteem from being able to help, and formal home care use may eliminate those feelings, e.g. by reminding the spouse that they are not capable of handling

the situation (e.g. Ribeiro et al. 2007). Other potential reasons are spouses feeling uncomfortable with having strangers in the house, or considering that professional domestic helpers don't perform the chores in the same way or as well as they used to themselves. This explanation fits the detrimental impacts on spousal mental health that we find, but not quite as well the detrimental impacts on physical health.

The third possibility is that the previous results reflect reverse causality, whereby couples hire formal home care when one spouse is no longer healthy enough to care for the other, after significant health deterioration since baseline (section 3.5). This is consistent with the significant effects found only for professional domestic help: spouses, particularly women, likely only hire professional domestic help when they are no longer able to do the domestic chores themselves. This explanation is also consistent with the non-significant effects for those who provide informal care to someone else outside the household, because they must still be in relatively good health to be able to do so. We explore reverse causality in section 4.5.

4.4 Impacts of formal home care on spousal informal caregiving, and of spousal informal caregiving on health

In this section we explore (1) the impacts of formal home care use on the likelihood of spousal informal caregiving, and (2) the impacts of spousal informal caregiving on physical and mental health. To estimate (1), the only methodological changes to the empirical strategy used so far are the inclusion of lagged informal caregiving among the matching variables, and the use of a probit instead of a linear model, to account for the binary nature of the dependent variable. The marginal effects are reported in Appendix F, Table F1. On average, formal home care use increases the likelihood of spousal informal caregiving by a sizeable 17 percentage points for women ($p<0.01$), and 12 percentage points for men ($p<0.01$), indicating that formal home care and spousal informal care are complements, on the extensive margin. This is true for both types of formal home care, although the magnitude of the marginal effects suggest that professional personal care and spousal informal caregiving are stronger complements than professional domestic help and spousal informal caregiving (available upon request).

To estimate (2), we use the same baseline empirical strategy, except the right hand-side variable of interest is a dummy that indicates if the individual provides informal care to the spouse, instead

of formal home care use. Results are shown in Appendix F, Table F2. We find positive impacts of spousal informal caregiving on physical health and negative impacts on mental health, but only for women and only significant at the 10% significance level. For men, the coefficients are statistically zero. We also explore potential reverse causality issues in this estimation in the next section.

Despite the complementarity between formal home care and spousal informal care (1), given that spousal informal caregiving has limited impacts on health (2), the results in Table 1 —particularly the strong negative impact of formal home care on the physical health of female spouses— seem suspicious. We now turn to exploring the reverse causality possibility.

4.5 Exploration of potentially remaining endogeneity

As discussed in section 3.5, important health changes of potentially caregiving spouses since $t-1$ may impact both treatment status and spousal (i.e. own) health in t (a confounding effect that we would like to clean out), although they may also be caused by formal home care use (an effect that we would like to capture). To explore the extent of these two effects, we split the sample into potentially caregiving spouses who suffered a physical/mental health shock and those who didn't. Health shocks are defined as drops of at least one standard deviation in the corresponding health variable. Looking only at potentially caregiving spouses who did not suffer a health shock minimizes the possibility that formal home care use was prompted by worsening own health, which would also explain poor health status in t. The estimations in this subsample produce coefficients that are statistically and economically indistinguishable from zero, suggesting that the strong negative effects found earlier are at least partly due to reverse causality (Appendix G). In the subsample of potentially caregiving spouses who suffered a health shock, the estimated coefficients are still sizably negative —though smaller in magnitude—, but imprecisely estimated, possibly due to lack of statistical power. Therefore, we are inclined to conclude that formal home care has little to no impact on spousal health, in the short run.

We also explore the possibility of reverse causality in the estimation of the impacts of spousal informal caregiving on health presented in section 4.4. In particular, the positive estimated coefficient in the case of physical health of female spouses may be due to the fact that to be able to provide informal care to their partner, the spouses cannot have experienced a significant health

decline. In the subsample of spouses who did not experience health shocks, there are no statistically significant impacts of spousal informal caregiving on health (available upon request).[12] If spousal informal caregiving is not bad for health (again, in the short run), then complementarity between formal home care and spousal informal care does not explain our initial findings of detrimental impacts of formal home care use on spousal health.

4.6 Sensitivity and falsification tests

We test the sensitivity of our baseline results to the choice of bandwidth and to the exclusion of extreme propensity scores. Using bandwidths equal to 0.02 or 0.06, instead of 0.04, provides virtually the same results. Excluding observations with propensity scores in the bottom or top 5% provides qualitatively the same results, with slight changes in magnitudes and significance. We also compare the results with those obtained using simple regression adjustment, without using the kernel weights from the matching procedure. Again, results are very similar, with only very small changes in magnitudes. These results are presented in Appendix H, along with results from two falsification tests.

5 Discussion

Our study provides three main findings. First, formal home care has little to no impact on spousal physical or mental health, for men or women, in the short run. A likely explanation is that couples hire formal home care when both spouses' health declines significantly —at least one spouse starts to need formal help with daily activities, and the other spouse is no longer healthy enough to provide sufficient help. Second, formal home care and spousal informal care are complements on the extensive margin. Third, in our sample and short time horizon, spousal informal caregiving does not seem to impact health.

We apply the methodology of Schmitz and Westphal (2015), Stöckel and Bom (2020), and de Zwart et al. (2017), who study the impacts of informal caregiving on health. When we adapt their

[12] Again, we do not include shocks to the health of the potentially caregiving spouse in the main specification because they may absorb an effect of caregiving that we would like to capture, i.e. we believe that in some cases, informal caregiving may cause significant drops in spousal health. The detrimental impact of spousal informal caregiving on mental health of female spouses that we find seems plausible (Appendix F, Table F2).

specification to study the impacts of formal home care on spousal health, we find detrimental impacts of formal home care use. However, after exploring the risk of remaining endogeneity, we conclude that formal home care likely does not impact spousal health —it is probably the omitted deterioration of the potentially caregiving spouse's health between baseline and t that explains the worse health in t (first main finding).

We also estimate the impacts of spousal informal caregiving on health using those authors' methodology. Again, when we explore the risk that the econometric specification does not fully rule out all sources of endogeneity, we conclude that there are no effects of spousal informal caregiving on health (third main finding). In contrast, Schmitz and Westphal (2015), Stöckel and Bom (2020), and de Zwart et al. (2017) tend to find detrimental health impacts of spousal informal caregiving.

Our explorations suggest that the matching methodology employed in those studies and in ours is not enough to completely rule out endogeneity of formal home care, in our case, and potentially, endogeneity of informal care, in their case. In their case, the detrimental impacts of (spousal) informal care appear strong enough to more than compensate the mitigating effect of reverse causality (i.e. lower bound effect). However, with the exception of Stöckel and Bom (2020), the estimated effects in those studies may be capturing the emotional strain of observing the deterioration of the care receiver's health, because they do not specifically account for the family effect. In our case, we do not find a positive impact of formal home care that could potentially be a lower bound effect.

Fully addressing endogeneity of formal home care (with survey data) likely requires finding a valid instrumental variable, like the ones employed by Juin (2019), who uses a local-level indicator of reliance on a subsidy for formal home care use in France, Perdrix and Roquebert (2019), who use the lowest regulated price of formal home care at the local level, also in France, or Carrino et al. (2018), who use an indicator of eligibility for public home care programs based on variations in needs-based eligibility criteria across four European countries. However, such strategy is likely to require focusing on fewer countries, like those studies, because it is hard to collect the data for and devise an instrument that is comparable across countries.

Our second main finding is in line with Carrino et al. (2018), who find complementarity between formal home care and informal caregiving in four European countries and interpret it in light of

substantial unmet LTC needs in the population —home care professionals likely identify unmet needs and require additional support from relatives, possibly and especially spouses. To investigate this further, we look at the duration and intensity of formal home care utilization in our data, in the waves where we do have such information (only waves 1, 2, and 7, which prevented us from looking at this formally, using our identification strategy). The duration and intensity variables distinguish between formal personal care and domestic help. Regarding personal care, almost half of the users received personal care services for three months or less, and slightly less than one third of the users received personal care for the whole year. This means that many situations correspond to short-term post-acute personal care services rather than LTC. Although we partly account for this by restricting the sample to individuals with limitations in the (I/)ADL lasting longer than three months, this may also explain why we don't find impacts of formal home care. As for intensity of use, one third of the users received only one hour of personal care per week; more than half of the users received only 1-3 hours of personal care per week. The use of domestic help is more predominant, with median weeks/year at 48 weeks (median weeks/year of personal care=18) and median hours/week at 4 hours (median hours/week of personal care=3). This low intensity does suggest that starting to use formal home care may signal the severity of the condition of the dependent spouse and require personal support from the other spouse, rather than formal home care substituting for spousal informal caregiving.

Although SHARE data are exceptionally rich, as mentioned we are unable to assess formally the impacts of quantity of formal home care use on spousal health. If the next waves maintain the intensity questions, this could be explored in a few years. A second data-related limitation has to do with the gaps, as our empirical strategy relies on information from the previous wave. This prevents us from studying medium to long run impacts of formal home care use (we seldom observe couples more than twice). We also end up with relatively small samples, with prevents further explorations of potentially heterogeneous effects and hinders precision.

Spouse informal caregivers provide much of the long-term support required by dependent older adults. Caregiving can be burdensome, physically and mentally, although depending on a number of factors, it can also involve positive experiences, such as a sense of self-esteem from being able to help. Formal home care interacts with informal home care, such that policies aimed at fostering formal LTC should take into consideration, besides costs and outcomes of the care receivers, the effects on caregivers and family members in general, including spouses. Our results suggest

limited or no impacts of formal home care on spousal health, in the short run. However, in the long run, home care may impact spousal health. It could also be that among formal home care users, increasing the amount of support would improve the health of the spouse (e.g. higher intensity could substitute for some informal caregiving). In fact, Juin (2019), who consider French non-coresiding adult children caring for their parents, finds that an increase in formal home care hours protects the health of caregivers. Besides, if the main explanation for complementarity between formal home care and informal care (along the extensive margin) is indeed the existence of significant unmet LTC needs, as advanced by Carrino et al. (2018), then as formal home care reaches more people, the mechanism whereby home care providers identify needs and solicit more support from spouses fades.

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Appendix A

A.1 Further details on the sample selection procedure

This study uses data from Wave 1 (2004/05, 12 countries), Wave 2 (2006/07, 15 countries), Wave 4 (2011/12, 3 countries), Wave 5 (2013, 15 countries), Wave 6 (2015, 18 countries), and Wave 7 (2017, 12 countries). The survey questionnaire applied in Wave 3 covered respondents' life histories (SHARELIFE) and is not comparable with the regular questionnaire. Similarly in Wave 7, respondents that weren't in the sample at the time of the SHARELIFE wave answered the SHARELIFE questionnaire instead of the regular one (all respondents in the countries that joined the SHARE project after Wave 3 and respondents from refreshment samples in the other countries, corresponding to about 80% of the Wave 7 sample). Lastly, this study only includes 3 countries in Wave 4 because the formal home care use questions were not included in the main questionnaire that year —only France, Spain, and Hungary included formal home care use questions in an extra country-specific module.

Apart from the availability of formal home care use information, which dictates the inclusion of waves/countries as explained above, we apply the following criteria for defining our main study sample. First, we select individuals that live with their spouse/partner, also included in the dataset. That is, we keep households where we have both members of the couple, whether they are married or not. SHARE surveys individuals 50 years and older and their partners irrespective of age and includes couple identifiers that allow matching both members of a couple. Second, we identify individuals that report any limitation in the activities of daily living (ADL: dressing, walking across a room, bathing/showering, eating, getting in or out of bed, using the toilet) or the instrumental activities of daily living (IADL: cooking, shopping, answering the phone, taking medications, housekeeping, managing money)[13] in a given wave. The goal is to identify LTC needs and not temporary needs following, for example, an acute health shock. The question on formal home care use refers to any utilization in the past year, which means it could capture temporary users (i.e. post-acute care rather than LTC). The question on limitations refers to the present and explicitly tries to capture long-term needs: "*Please tell me if you have any difficulty with these activities because of a physical, mental,*

[13] SHARE includes a seventh IADL limitation, "Using a map in a strange place", which we found to be (counterintuitively) positively related to self-assessed health and hence did not take into account. Some individuals may never have had the ability to use maps; this limitation does not necessarily capture a health or cognitive impairment that arose with age. In fact, this limitation is not part of the original IADL list (see e.g. Katz 1983).

emotional, or memory problem. Exclude any difficulties that you expect to last less than three months."

A.2 Further details on the formal home care use variable

Information on formal home care use by the household, the variable of main interest to us, is based on the potential care receiver's answer to the question *"During the last twelve months, did you receive in your own home any professional or paid services listed on this card due to a physical, mental, emotional or memory problem? 1. Help with personal care (e.g. getting in and out of bed, dressing, bathing and showering) 2. Help with domestic tasks (e.g. cleaning, ironing, cooking)"*. This is the question in the Wave 7 questionnaire. It has suffered slight changes from wave to wave (Table A1).

Table A1. Comparability of the formal home care use variable across waves

	Formal home care use question	**Information on duration of formal home care use?**
Wave 1	During the last twelve months, did you receive in your own home any of the kinds of care mentioned on this card? 1. Professional or paid nursing or personal care 2. Professional or paid home help, for domestic tasks that you could not perform yourself due to health problems 3. Meals-on-wheels	Yes (How many weeks and how many hours per week, for nursing/ personal care and domestic help)
Wave 2	During the last twelve months, did you receive in your own home any of the kinds of care mentioned on this card? 1. Professional or paid nursing or personal care 2. Professional or paid home help, for domestic tasks that you could not perform yourself due to health problems 3. Meals-on-wheels	Yes (How many weeks and how many hours per week, for nursing/ personal care and domestic help)
Wave 3	SHARELIFE —data from this wave are not used.	
Wave 4	Not available in the main questionnaire. France, Spain, and Hungary asked about "receipt of professional/paid nursing/personal care in own home" and "receipt of professional/paid home help for domestic tasks due to health problems"	No

Wave 5	During the last twelve months, did you receive in your own home any professional or paid services listed on this card due to a physical, mental, emotional or memory problem? 1. Help with personal care (e.g. getting in and out of bed, dressing, bathing and showering) 2. Help with domestic tasks (e.g. cleaning, ironing, cooking) 3. Meals-on-wheels (i.e. ready-made meals provided by a municipality or a private provider) 4. Help with other activities (e.g. filling a drug dispenser)	No
Wave 6	During the last twelve months, did you receive in your own home any professional or paid services listed on this card due to a physical, mental, emotional or memory problem? 1. Help with personal care (e.g. getting in and out of bed, dressing, bathing and showering) 2. Help with domestic tasks (e.g. cleaning, ironing, cooking) 3. Meals-on-wheels (i.e. ready-made meals provided by a municipality or a private provider) 4. Help with other activities (e.g. filling a drug dispenser)	No
Wave 7	During the last twelve months, did you receive in your own home any professional or paid services listed on this card due to a physical, mental, emotional or memory problem? 1. Help with personal care (e.g. getting in and out of bed, dressing, bathing and showering) 2. Help with domestic tasks (e.g. cleaning, ironing, cooking) 3. Meals-on-wheels (i.e. ready-made meals provided by a municipality or a private provider) 4. Help with other activities (e.g. filling a drug dispenser)	Yes (How many weeks and how many hours per week, for nursing/ personal care and domestic help)

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Appendix B

B.1 Measure of physical health

SHARE data include a rich battery of health indicators. As usual in surveys of this type, one of the available health variables is self-assessed health, in five levels —Excellent, Very good, Good, Fair, or Poor. Albeit subjective, this is possibly the most comprehensive health variable available. Other, more objective, variables capture specific dimensions of health (e.g. specific health conditions like diabetes, specific limitations like not being able to climb a flight of stairs), and are subject to measurement errors. However, precisely because of the underlying subjectivity, it may be difficult or inappropriate to compare individuals based on self-assessed health, because different individuals interpret the question and the levels differently (e.g. individuals from different demographic or socioeconomic groups; Bago d'Uva et al. 2008a, 2008b). It may even be difficult to compare the same individual over time using self-assessed health, because of the so-called state dependence (e.g. Contoyannis et al. 2004).

One methodology frequently employed in the literature to overcome those biases in self-assessed health and at the same time measure health comprehensively is to generate a health index, by regressing self-assessed health on a set of objective health indicators using an ordered probit model and predicting the underlying latent variable. We do just that, following for example Coe and Zamarro (2011), García-Gomez et al. (2010), Jürges (2007), and Ryser et al. (2018).[14]

The health variables included in the model are binary indicators for health conditions (heart attack, hypertension, cholesterol, stroke, diabetes, lung disease, cancer, ulcer, Parkinson's, cataracts, and hip fracture), binary indicators for symptoms/troubles (pain, falls, fear of falling, dizziness), categorized body mass index (underweight, normal, overweight, obese), whether the individual was hospitalized in the past year, grip strength (maximum grip strength measure, treated continuously, and binary indicators for individuals unwilling or unable to take the grip

[14] Bonsang (2009) applies the same methodology to compute a disability index, regressing not self-assessed health but a variable that captures the degree of limitations (severely limited, limited but not severely, not limited) on dummy indicators of limitations in each ADL/IADL and other variables. De Meijer et al. (2009) and Kohn and Averett (2014) apply the same reasoning for computing a health/disability index but employ instead principal components and multiple correspondence analysis, respectively. Bound et al. (1999) and Lindeboom and Kerkhofs (2009) account for the biases in self-assessed health by modelling it as a function of objective health indicators within their integrated models for health and work decisions, even though they never actually need to compute the underlying health indices because they estimate the models jointly.

strength test), binary indicators for each mobility limitation (walking 100 meters, sitting for two hours, getting up from a chair, climbing several flights of stairs, climbing one flight of stairs, stooping/kneeling/crouching, reaching or extending the arms above the shoulders, pulling or pushing large objects, lifting or carrying weights over 5 kilograms, picking up a small coin from a table), binary indicators for each ADL limitation (dressing, walking across a room, bathing/showering, eating, getting in or out of bed, using the toilet), and binary indicators for each IADL limitation (cooking, shopping, answering the phone, taking medications, housekeeping, managing money).

The data are treated as pooled cross-sections and the standard errors are clustered at the couple level, accounting for correlations in the errors both between individuals living together and for the same individual over time. The health index is obtained by predicting the latent variable underlying the ordered probit model and standardizing the predictions. So, changes in the health index are interpreted in standard deviations.

Table B1 reports the estimation results. The table also shows the summary statistics of the included health indicators. Overall, the health indicators have the expected associations with self-assessed health. The four coefficients with unexpected signs that are statistically significant correspond to (I/)ADL limitations with very low frequencies; given that most health indicators are binary, we suspect some degree of multicollinearity may be at the root of these results. The distribution of the resulting standardized health index is plotted in Figure B1.

Table B1. Results of the ordered probit model to predict the health index (full sample)

	Descriptive statistics	**Oprobit estimation results**
	Average (Standard deviation)	**Coefficient (Standard error)**
Health conditions		
Heart attack	0.11206	-0.48474***
	(0.31545)	(0.01405)
Hypertension	0.37874	-0.22385***
	(0.48507)	(0.00914)
Cholesterol	0.24253	-0.07544***
	(0.42862)	(0.00967)
Stroke	0.03278	-0.35855***
	(0.17806)	(0.02625)
Diabetes	0.12307	-0.34388***
	(0.32852)	(0.01353)

Lung disease	0.05404	-0.48966***
	(0.22610)	(0.02004)
Cancer	0.04577	-0.48508***
	(0.20900)	(0.02161)
Ulcer	0.03937	-0.28407***
	(0.19447)	(0.02148)
Parkinson's	0.00776	-0.67960***
	(0.08773)	(0.06404)
Cataracts	0.06940	-0.05267***
	(0.25414)	(0.01612)
Hip fracture	0.01340	-0.03551
	(0.11499)	(0.03715)
Symptoms/troubles		
Pain	0.40834	-0.34308***
	(0.49153)	(0.00846)
Falls	0.04908	-0.11361***
	(0.21604)	(0.02001)
Fear of falling	0.09174	-0.15475***
	(0.28866)	(0.01600)
Dizziness	0.11574	-0.30946***
	(0.31992)	(0.01327)
BMI (ref.: normal weight)		
Underweight	0.00912	-0.13507***
	(0.09506)	(0.05004)
Overweight	0.43211	-0.10359***
	(0.49537)	(0.00988)
Obese	0.20817	-0.20928***
	(0.40600)	(0.01279)
Acute events		
Hospitalized in the past year	0.13667	-0.33968***
	(0.34350)	(0.01183)
Grip strength		
Unable to take measurement	0.03578	-0.28646***
	(0.18575)	(0.02852)
Unwilling to take measurement	0.02290	-0.01213
	(0.14959)	(0.02862)
Maximum grip strength measure	32.89766	0.00710***
	(13.95620)	(0.00039)
Mobility limitations		
Walking 100 meters	0.07967	-0.29530***
	(0.27079)	(0.01993)
Sitting for two hours	0.09218	-0.15616***
	(0.28929)	(0.01554)
Getting up from a chair	0.16304	-0.09020***
	(0.36941)	(0.01285)
Climbing several flights of stairs	0.24405	-0.27594***
	(0.42952)	(0.01147)

Climbing one flight of stairs	0.10098	-0.12023***
	(0.30130)	(0.01651)
Stooping/kneeling/crouching	0.26719	-0.21447***
	(0.44250)	(0.01109)
Reaching or extending the arms above the shoulders	0.07661	-0.13547***
	(0.26597)	(0.01734)
Pulling or pushing large objects	0.11786	-0.17917***
	(0.32245)	(0.01627)
Lifting or carrying weights over 5 kilograms	0.16780	-0.24156***
	(0.37369)	(0.01339)
Picking up a small coin from a table	0.03111	-0.08300***
	(0.17362)	(0.02759)
Limitations in the ADLs		
Dressing	0.06116	-0.13667***
	(0.23962)	(0.02227)
Walking across a room	0.01491	0.17742***
	(0.12119)	(0.05576)
Bathing/showering	0.03804	-0.05746*
	(0.19129)	(0.03359)
Eating	0.01386	0.10664**
	(0.11693)	(0.05262)
Getting in or out of bed	0.02825	-0.05489
	(0.16569)	(0.03400)
Using the toilet	0.01696	0.10956**
	(0.12912)	(0.04697)
Limitations in the IADLs		
Cooking	0.02750	0.02839
	(0.16355)	(0.03945)
Shopping	0.04050	-0.15164***
	(0.19712)	(0.03273)
Answering the phone	0.01465	-0.15365***
	(0.12016)	(0.05087)
Taking medications	0.01336	0.03234
	(0.11482)	(0.05732)
Housekeeping	0.08376	-0.19499***
	(0.27703)	(0.01956)
Managing money	0.02740	-0.18918***
	(0.16325)	(0.03503)
Cut-offs		
1		-2.65015***
		(0.01969)
2		-1.18060***
		(0.01688)
3		0.13876***
		(0.01664)
4		1.09204***
		(0.01731)

Pseudo R-squared		0.178
Number of observations	97,588	97,588
Number of couples		19,288

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. All variables are binary except for the maximum grip strength measure (0-90). The sample pools both members of the couple and multiple observations over time. Individuals only observed in one wave are already excluded.

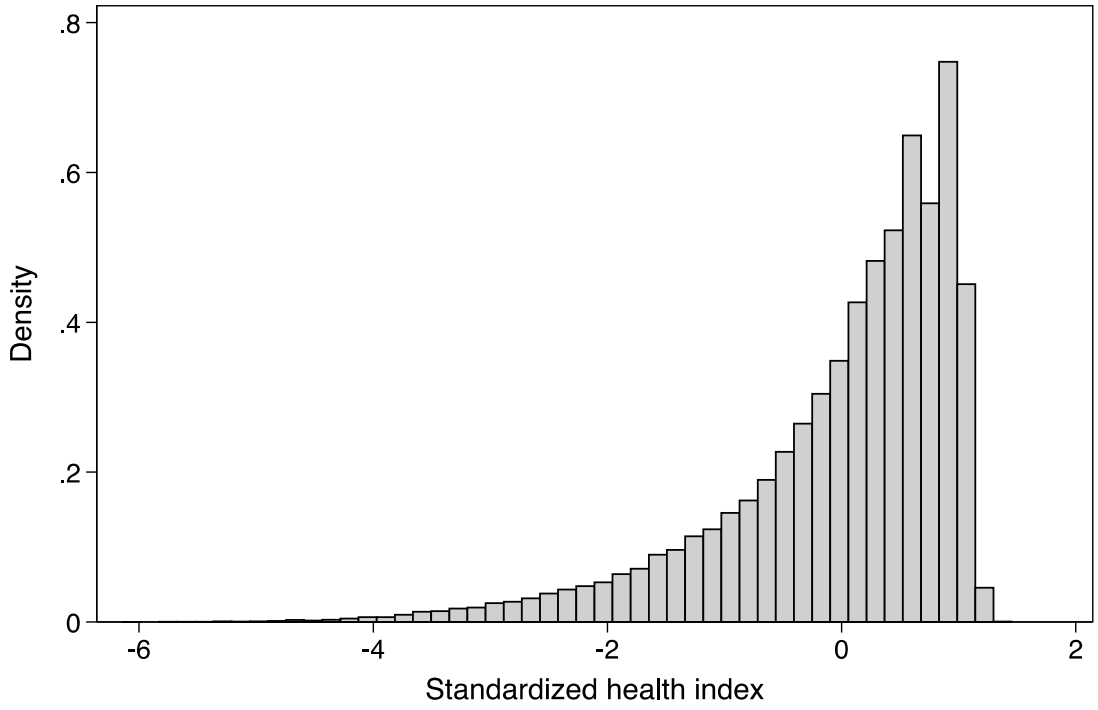

Figure B1. Distribution of the health index (average=0 and standard deviation=1)

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Appendix C

Table C1. Summary statistics by formal home care use and gender of the potential caregiver: average (standard deviation)

	Formal home care use (t)			
	Women		Men	
	Non-users	Users	Non-users	Users
Outcomes (t)				
Potential caregiver's physical health	-0.426	-0.826	-0.255	-0.430
	(1.084)	(1.244)	(1.106)	(1.214)
Potential caregiver's mental health	8.789	8.203	9.745	9.161
	(2.402)	(2.534)	(2.145)	(2.566)
Health shocks since t-1				
Potential caregiver - physical health	0.120	0.189	0.128	0.153
	(0.325)	(0.393)	(0.334)	(0.361)
Potential caregiver - mental health	0.258	0.352	0.223	0.322
	(0.438)	(0.479)	(0.416)	(0.468)
Potential care receiver - physical health	0.257	0.423	0.249	0.269
	(0.437)	(0.495)	(0.433)	(0.444)
Potential care receiver - mental health	0.167	0.128	0.193	0.157
	(0.374)	(0.335)	(0.395)	(0.365)
Covariates (t-1)				
Potential caregiver's physical health	-0.277	-0.549	-0.061	-0.226
	(1.021)	(1.113)	(1.020)	(1.081)
Potential caregiver's mental health	9.073	8.885	9.986	9.723
	(2.408)	(2.353)	(2.043)	(2.252)
Potential caregiver's age	66.643	71.881	69.284	74.277
	(9.133)	(8.775)	(9.075)	(9.039)
Number of children	2.480	2.551	2.458	2.533

	(1.487)	(1.529)	(1.478)	(1.705)
Household size	2.370	2.229	2.383	2.260
	(0.868)	(0.665)	(0.899)	(0.684)
Potential caregiver's education (ref.: none/other)	0.061	0.128	0.051	0.058
	(0.239)	(0.335)	(0.220)	(0.234)
ISCED 1/2	0.464	0.414	0.418	0.434
	(0.499)	(0.494)	(0.493)	(0.497)
ISCED 3/4	0.334	0.317	0.341	0.314
	(0.472)	(0.466)	(0.474)	(0.465)
ISCED 5/6	0.142	0.141	0.190	0.194
	(0.349)	(0.349)	(0.392)	(0.396)
Income (euros)	29169.213	29020.263	30439.722	37422.636
	(32225.233)	(24181.612)	(35101.164)	(45545.776)
Wealth (euros)	2.26e+05	2.03e+05	2.51e+05	2.78e+05
	(3.33e+05)	(2.59e+05)	(4.79e+05)	(3.14e+05)
Wealth<0	0.027	0.031	0.024	0.017
	(0.162)	(0.173)	(0.153)	(0.128)
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)	0.807	0.885	0.786	0.888
	(0.395)	(0.319)	(0.411)	(0.315)
(Self-/)employed	0.174	0.088	0.188	0.091
	(0.380)	(0.284)	(0.391)	(0.288)
Permanently sick or disabled	0.019	0.026	0.026	0.021
	(0.135)	(0.161)	(0.160)	(0.143)
Charity or voluntary work	0.135	0.128	0.148	0.153
	(0.342)	(0.335)	(0.355)	(0.361)
Potential caregiver provides help outside the household	0.280	0.242	0.286	0.281
	(0.449)	(0.429)	(0.452)	(0.450)
Potential care receiver's physical health	-0.667	-0.991	-0.861	-1.244
	(1.152)	(1.201)	(1.090)	(1.184)
Potential care receiver's mental health	2.779	3.264	3.585	3.785
	(2.345)	(2.466)	(2.515)	(2.431)
Potential care receiver's age	70.277	75.665	66.644	71.909

	(9.323)	(8.913)	(9.277)	(9.724)
Country (ref.: Austria)	0.062	0.026	0.049	0.045
	(0.242)	(0.161)	(0.215)	(0.209)
Germany	0.087	0.123	0.084	0.074
	(0.281)	(0.330)	(0.278)	(0.263)
Sweden	0.075	0.079	0.096	0.074
	(0.264)	(0.271)	(0.295)	(0.263)
Netherlands	0.028	0.018	0.023	0.033
	(0.164)	(0.132)	(0.150)	(0.179)
Spain	0.096	0.137	0.098	0.149
	(0.294)	(0.344)	(0.298)	(0.357)
Italy	0.096	0.088	0.110	0.074
	(0.295)	(0.284)	(0.314)	(0.263)
France	0.073	0.093	0.073	0.116
	(0.261)	(0.290)	(0.261)	(0.321)
Denmark	0.068	0.062	0.083	0.045
	(0.252)	(0.241)	(0.276)	(0.209)
Greece	0.027	0.004	0.017	0.008
	(0.162)	(0.066)	(0.130)	(0.091)
Switzerland	0.017	0.022	0.018	0.021
	(0.130)	(0.147)	(0.134)	(0.143)
Belgium	0.114	0.154	0.110	0.194
	(0.318)	(0.362)	(0.313)	(0.396)
Israel	0.051	0.097	0.043	0.087
	(0.219)	(0.296)	(0.203)	(0.282)
Czech Republic	0.084	0.035	0.087	0.033
	(0.277)	(0.185)	(0.281)	(0.179)
Poland	0.033	0.009	0.029	0.004
	(0.177)	(0.094)	(0.167)	(0.064)
Luxemburg	0.005	0.004	0.006	0.017
	(0.069)	(0.066)	(0.076)	(0.128)
Slovenia	0.022	0.013	0.022	0.004

	(0.147)	(0.114)	(0.148)	(0.064)
Estonia	0.063	0.035	0.051	0.021
	(0.243)	(0.185)	(0.220)	(0.143)
Wave (ref.: wave 1)	0.297	0.366	0.295	0.343
	(0.457)	(0.483)	(0.456)	(0.476)
Wave 4	0.042	0.053	0.043	0.062
	(0.200)	(0.224)	(0.203)	(0.242)
Wave 5	0.428	0.427	0.424	0.405
	(0.495)	(0.496)	(0.494)	(0.492)
Wave 6	0.234	0.154	0.238	0.190
	(0.423)	(0.362)	(0.426)	(0.393)
Observations	1445	227	1213	242

Appendix D

Table D1. Results of the propensity score models

	Women	Men
Health shocks since t-1		
Potential care receiver - physical health	0.50958***	0.24121**
	(0.09070)	(0.10326)
Potential care receiver - mental health	-0.30762**	-0.13185
	(0.13254)	(0.12206)
Covariates (t-1)		
Potential caregiver's physical health	-0.04254	-0.02201
	(0.04421)	(0.04497)
Potential caregiver's mental health	0.01842	-0.01677
	(0.01962)	(0.02190)
Potential caregiver's age	0.01732	-0.06923
	(0.06255)	(0.06770)
Potential caregiver's age^2	0.00008	0.00063
	(0.00044)	(0.00046)
Number of children	-0.02417	-0.02300
	(0.02769)	(0.02685)
Household size	0.02550	0.00106
	(0.06067)	(0.06088)
Potential caregiver's education (ref.: none/other)		
ISCED 1/2	-0.19274	0.24069
	(0.15028)	(0.17915)
ISCED 3/4	0.06071	0.31611
	(0.17321)	(0.19856)
ISCED 5/6	0.14398	0.29931
	(0.19446)	(0.21123)
Income (ln)	0.02276	0.18479***
	(0.05455)	(0.06562)
Wealth (sqrt)	-0.00035*	0.00004
	(0.00019)	(0.00018)
Wealth<0	0.06147	0.08237
	(0.26645)	(0.30483)
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)		
(Self-/)employed	0.07105	0.05668
	(0.15565)	(0.17375)
Permanently sick or disabled	0.46747*	0.26473
	(0.26318)	(0.30843)
Charity or voluntary work	-0.05573	0.08022
	(0.12756)	(0.12170)
Potential caregiver provides help outside the household	0.13292	0.13996
	(0.09999)	(0.10155)
Potential care receiver's physical health	-0.14117***	-0.22102***
	(0.04203)	(0.04355)

Potential care receiver's mental health	0.04887**	-0.01652
	(0.02191)	(0.02081)
Potential care receiver's age	0.02128**	0.02293**
	(0.00922)	(0.01016)
Country (ref.: Austria)		
Germany	0.62511**	0.01421
	(0.24947)	(0.24374)
Sweden	0.56382**	-0.08912
	(0.26288)	(0.24626)
Netherlands	0.20500	0.36521
	(0.35652)	(0.32306)
Spain	0.56859**	0.55267**
	(0.26492)	(0.25007)
Italy	0.45572*	-0.09983
	(0.26298)	(0.25563)
France	0.60884**	0.52310**
	(0.27164)	(0.24870)
Denmark	0.50852*	-0.19391
	(0.27326)	(0.26392)
Greece	-0.32201	-0.31771
	(0.49348)	(0.44515)
Switzerland	0.85155**	0.15024
	(0.37143)	(0.35235)
Belgium	0.83258***	0.45527**
	(0.24589)	(0.22794)
Israel	0.97019***	0.69612***
	(0.27198)	(0.26095)
Czech Republic	-0.18344	-0.36616
	(0.29528)	(0.28589)
Poland	-0.16696	-1.02998*
	(0.39567)	(0.53898)
Luxemburg	0.59472	0.77887*
	(0.65792)	(0.45245)
Slovenia	0.11308	-0.75642
	(0.38584)	(0.50392)
Estonia	-0.18507	-0.23834
	(0.29821)	(0.31101)
Wave (ref.: wave 1)		
Wave 4	-0.02625	-0.35926*
	(0.20960)	(0.21566)
Wave 5	-0.11031	-0.10111
	(0.10739)	(0.11009)
Wave 6	-0.33201**	-0.19450
	(0.13195)	(0.13109)
Constant	-5.22006**	-3.14447
	(2.27600)	(2.56934)
Pseudo R-squared	0.165	0.150
Number of observations	1,804	1,574

*p<0.1, **p<0.05, ***p<0.01.

Table D2. Balance of covariates before and after matching (averages) —women sample

	Unmatched		Matched	Standardized bias (%)	
	T	C	C	U	M
Health shocks since t-1					
Potential care receiver - physical health	.408	.25453	.39624	33.0	2.5
Potential care receiver - mental health	.12	.16451	0.11288	-12.8	2.1
Covariates (t-1)					
Potential caregiver's physical health	-0.56156	-0.30898	-0.6216	-23.2	5.4
Potential caregiver's mental health	8.872	9.0253	8.7362	-6.4	5.6
Potential caregiver's age	72.124	66.87	72.17	59	-0.5
Potential caregiver's age^2	5275.3	4556.3	5289.5	58.8	-1.1
Number of children	2.616	2.5039	2.6241	6.9	-0.5
Household size	2.228	2.3756	2.2789	-18.7	-6.4
Potential caregiver's education (ref.: none/other)					
ISCED 1/2	0.416	0.46697	0.42649	-10.3	-2.1
ISCED 3/4	0.3	0.32448	0.2837	-5.3	3.5
ISCED 5/6	0.14	0.13536	0.13676	1.3	0.9
Income (ln)	9.9464	9.8643	9.9163	8.6	3.2
Wealth (sqrt)	383.12	393.16	386.14	-4	-1.2
Wealth<0	0.024	0.0272	0.02451	-2	-0.3
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)					
(Self-/)employed	0.084	0.17034	0.08636	-26.1	-0.7
Permanently sick or disabled	0.032	0.01813	0.03459	8.9	-1.7
Charity or voluntary work	0.124	0.13083	0.11117	-2	3.9
Potential caregiver provides help outside the household	0.228	0.27202	0.2224	-10.2	1.3
Potential care receiver's physical health	-0.9047	-0.67152	-0.99493	-20.3	7.6
Potential care receiver's mental health	3.156	2.7694	3.1554	16.2	0
Potential care receiver's age	75.804	70.485	75.693	59.1	1.2
Country (ref.: Austria)					
Germany	0.116	0.08484	0.10793	10.4	2.7
Sweden	0.08	0.07124	0.07314	3.3	2.6
Netherlands	0.016	0.02655	0.02001	-7.3	-2.8
Spain	0.16	0.10492	0.1893	16.3	-8.6
Italy	0.088	0.0965	0.10067	-2.9	-4.4
France	0.084	0.07383	0.07	3.8	5.2
Denmark	0.06	0.06412	0.05147	-1.7	3.6
Greece	0.004	0.03044	0.00682	-20.4	-2.2
Switzerland	0.02	0.01619	0.02086	2.9	-0.7
Belgium	0.156	0.11205	0.1479	12.9	2.4
Israel	0.1	0.05246	0.0856	18	5.2
Czech Republic	0.032	0.08484	0.03313	-22.7	-0.5
Poland	0.012	0.03433	0.01334	-14.9	-0.9
Luxemburg	0.004	0.00453	0.00319	-0.8	1.3
Slovenia	0.012	0.02202	0.01317	-7.7	-0.9

Estonia	0.032	0.06153	0.03764	-14	-2.7
Wave (ref.: wave 1)					
Wave 4	0.06	0.04598	0.06673	6.3	-3
Wave 5	0.412	0.41775	0.4105	-1.2	0.3
Wave 6	0.168	0.24547	0.16353	-19.2	1.1
Observations	250	1,544	1,544		

T=treatment group, C=comparison group, U=unmatched, M=matched. Sample limited to the region of common support.

Table D3. Balance of covariates before and after matching (averages) —men sample

	Unmatched		**Matched**	**Standardized bias (%)**	
	T	**C**	**C**	**U**	**M**
Health shocks since t-1					
Potential care receiver - physical health	0.26692	0.24637	0.25705	4.7	2.3
Potential care receiver - mental health	0.15414	0.19128	0.15109	-9.8	0.8
Covariates (t-1)					
Potential caregiver's physical health	-0.28759	-0.09419	-0.27459	-17.9	-1.2
Potential caregiver's mental health	9.6992	9.9174	9.7787	-10	-3.6
Potential caregiver's age	74.714	69.682	74.572	55.2	1.6
Potential caregiver's age^2	5663.3	4940.6	5643.3	55.8	1.5
Number of children	2.5263	2.4935	2.5539	2	-1.7
Household size	2.2594	2.3902	2.273	-16.4	-1.7
Potential caregiver's education (ref.: none/other)					
ISCED 1/2	0.45113	0.42234	0.4422	5.8	1.8
ISCED 3/4	0.29699	0.33971	0.30143	-9.2	-1
ISCED 5/6	0.18421	0.17904	0.18116	1.3	0.8
Income (ln)	10.11	9.8927	10.119	23.8	-1
Wealth (sqrt)	441.2	408.14	438.78	12.2	0.9
Wealth<0	0.01504	0.02295	0.01933	-5.8	-3.1
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)					
(Self-/)employed	0.08271	0.18057	0.09032	-29.2	-2.3
Permanently sick or disabled	0.0188	0.02601	0.01734	-4.9	1
Charity or voluntary work	0.15038	0.13772	0.14516	3.6	1.5
Potential caregiver provides help outside the household	0.2594	0.27544	0.25187	-3.6	1.7
Potential care receiver's physical health	-1.2845	-0.88206	-1.2643	-34.9	-1.7
Potential care receiver's mental health	3.7481	3.6129	3.7125	5.4	1.4
Potential care receiver's age	72.32	66.982	72.258	56.4	0.6
Country (ref.: Austria)					
Germany	0.07143	0.08034	0.07307	-3.4	-0.6
Sweden	0.07519	0.09105	0.06832	-5.7	2.5
Netherlands	0.03008	0.02142	0.03278	5.5	-1.7
Spain	0.16541	0.09946	0.16672	19.5	-0.4
Italy	0.07143	0.114	0.0748	-14.7	-1.2
France	0.10902	0.07269	0.10205	12.7	2.4

Denmark	0.04511	0.07804	0.04117	-13.7	1.6
Greece	0.00752	0.02142	0.00789	-11.7	-0.3
Switzerland	0.02256	0.01683	0.0214	4.1	0.8
Belgium	0.18421	0.10635	0.18232	22.2	0.5
Israel	0.09774	0.05279	0.10165	17.1	-1.5
Czech Republic	0.03008	0.08646	0.0313	-24.2	-0.5
Poland	0.00376	0.03137	0.00559	-21.1	-1.4
Luxemburg	0.01504	0.00536	0.01797	9.6	-2.9
Slovenia	0.00376	0.02448	0.00508	-17.6	-1.1
Estonia	0.02256	0.05126	0.02602	-15.3	-1.8
Wave (ref.: wave 1)					
Wave 4	0.06015	0.04438	0.04866	7.1	5.2
Wave 5	0.40226	0.41546	0.39812	-2.7	0.8
Wave 6	0.18797	0.24866	0.19859	-14.7	-2.6
Observations	266	1,307	1,307		

T=treatment group, C=comparison group, U=unmatched, M=matched. Sample limited to the region of common support.

Appendix E

Table E1. Impacts of formal home care use on spousal health, by gender of the (potential) caregiver (full results)

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
Home care use (t)	-0.18092***	-0.22724	-0.06705	-0.30469*
	(0.06861)	(0.15064)	(0.06625)	(0.16192)
Health shocks since t-1				
Potential care receiver - physical health	-0.00958	-0.46129***	-0.06656	-0.14011
	(0.07158)	(0.16893)	(0.08193)	(0.19978)
Potential care receiver - mental health	0.00601	0.42846*	-0.13566	0.43066*
	(0.11298)	(0.24529)	(0.09589)	(0.23501)
Covariates (t-1)				
Potential caregiver's physical health	0.66147***	0.37651***	0.66670***	0.54874***
	(0.04100)	(0.08278)	(0.04029)	(0.09597)
Potential caregiver's mental health	0.02191	0.39303***	0.03596*	0.42226***
	(0.01709)	(0.03959)	(0.01858)	(0.04544)
Potential caregiver's age	-0.00523	0.04123	-0.02649	-0.10897
	(0.05091)	(0.12748)	(0.05751)	(0.12263)
Potential caregiver's age^2	-0.00013	-0.00020	0.00009	0.00064
	(0.00036)	(0.00087)	(0.00038)	(0.00083)
Number of children	-0.02817	-0.05768	-0.04798**	0.05100
	(0.02695)	(0.05706)	(0.02285)	(0.05898)
Household size	-0.01129	-0.19097*	-0.02490	-0.10978
	(0.06673)	(0.11203)	(0.07104)	(0.14234)
Potential caregiver's education (ref.: none/other)				
ISCED 1/2	0.17123	-0.11777	0.06880	-0.33904
	(0.14710)	(0.33316)	(0.17602)	(0.42586)
ISCED 3/4	0.20926	-0.30866	0.05784	-0.58302
	(0.16306)	(0.36168)	(0.18316)	(0.47459)
ISCED 5/6	0.10339	-0.42658	0.06180	-0.38096
	(0.17724)	(0.38770)	(0.19258)	(0.47545)
Income (ln)	0.02123	0.18800**	0.09165	0.10751
	(0.04816)	(0.09061)	(0.07112)	(0.11617)
Wealth (sqrt)	0.00049***	0.00030	0.00009	-0.00041
	(0.00016)	(0.00032)	(0.00013)	(0.00037)
Wealth<0	0.23221	0.03498	-0.04134	-0.72792
	(0.20140)	(0.40758)	(0.31545)	(0.76226)
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)				
(Self-/)employed	0.02765	-0.00952	0.11985	0.03894

	(0.11761)	(0.31844)	(0.13295)	(0.31099)
Permanently sick or disabled	-0.31077	-0.35948	0.12267	0.94443*
	(0.20265)	(0.47950)	(0.20271)	(0.49943)
Charity or voluntary work	-0.06441	0.18810	0.17727**	0.14696
	(0.08564)	(0.22274)	(0.07464)	(0.22193)
Potential caregiver provides help outside the household	0.05975	0.00431	-0.01750	-0.02457
	(0.07102)	(0.17513)	(0.07490)	(0.17954)
Potential care receiver's physical health	-0.02712	-0.08894	0.07183**	-0.02805
	(0.03974)	(0.07907)	(0.03446)	(0.08910)
Potential care receiver's mental health	0.03256	-0.06144	0.01570	-0.06017
	(0.01985)	(0.04312)	(0.01676)	(0.04119)
Potential care receiver's age	0.00730	-0.01118	0.00086	0.00853
	(0.00745)	(0.01513)	(0.00840)	(0.02053)
Country (ref.: Austria)				
Germany	-0.22492	-0.30432	0.24329	0.00952
	(0.17804)	(0.31429)	(0.22743)	(0.37083)
Sweden	0.12759	-0.24889	0.01705	-0.16772
	(0.17908)	(0.34590)	(0.20887)	(0.36118)
Netherlands	0.58500***	0.26620	0.34061	0.24337
	(0.19565)	(0.36877)	(0.24100)	(0.47434)
Spain	-0.27698	-1.22076***	0.38692*	-0.42596
	(0.21695)	(0.39761)	(0.22684)	(0.47317)
Italy	-0.27137	-1.66949***	0.19652	-0.70693
	(0.21462)	(0.37599)	(0.22188)	(0.49983)
France	0.13147	-0.21428	0.21412	-0.15451
	(0.20188)	(0.38304)	(0.20711)	(0.38632)
Denmark	0.08514	-0.47261	0.22912	0.19959
	(0.18254)	(0.36791)	(0.20174)	(0.38817)
Greece	-0.37608*	0.98484	-0.28595	-0.27038
	(0.21882)	(0.78586)	(0.31096)	(0.57586)
Switzerland	-0.26619	-0.65241	0.29132	0.20851
	(0.27139)	(0.42607)	(0.23858)	(0.49499)
Belgium	-0.13029	-0.35607	0.22487	-0.29965
	(0.18665)	(0.31339)	(0.19687)	(0.34857)
Israel	-0.61624***	-0.82989**	-0.16987	-0.75084*
	(0.23322)	(0.41576)	(0.23834)	(0.44456)
Czech Republic	-0.28389	0.08790	0.35060	0.05063
	(0.19978)	(0.39013)	(0.27723)	(0.52310)
Poland	-0.07261	0.68254	0.13182	-0.56008
	(0.33929)	(0.71977)	(0.33103)	(0.52736)
Luxemburg	-1.17890***	0.28237	-0.11520	-0.21461
	(0.26616)	(1.57250)	(0.26907)	(0.54402)
Slovenia	0.13958	-0.60546	0.32180	1.19284**
	(0.19732)	(0.51277)	(0.44176)	(0.49030)
Estonia	-0.19133	0.62130	0.17350	0.51512
	(0.20613)	(0.43847)	(0.24536)	(0.54646)

Wave (ref.: wave 1)				
Wave 4	-0.06546	0.62811	0.10042	0.37850
	(0.18751)	(0.45514)	(0.18499)	(0.40351)
Wave 5	0.12109	0.08102	0.03110	-0.06413
	(0.08874)	(0.19393)	(0.09783)	(0.21063)
Wave 6	0.14876	-0.02601	0.19043*	0.22448
	(0.10596)	(0.23806)	(0.09924)	(0.26327)
Constant	-0.52206	3.59055	-0.28535	9.32154**
	(1.85867)	(4.61699)	(2.23170)	(4.43076)
R-squared	0.555	0.383	0.531	0.328
Number of observations	1,702	1,735	1,498	1,503
Number of couples	1,609	1,641	1,411	1,412

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed.

Appendix F

Table F1. Impacts of formal home care use on the likelihood of informal caregiving to the partner (marginal effects)

	Women	Men
Home care use (t)	0.17377***	0.11976***
	(0.03066)	(0.03030)
Health shocks since t-1		
Potential care receiver - physical health	0.21899***	0.04541
	(0.03362)	(0.03967)
Potential care receiver - mental health	-0.12075**	-0.09938**
	(0.05370)	(0.04527)
Covariates (t-1)		
Informal care to spouse	0.22691***	0.08661*
	(0.04304)	(0.04762)
Potential caregiver's physical health	0.05658***	0.01445
	(0.01670)	(0.01658)
Potential caregiver's mental health	-0.00111	0.01487*
	(0.00764)	(0.00841)
Potential caregiver's age	0.01071	0.01484
	(0.02562)	(0.02720)
Potential caregiver's age^2	-0.00015	-0.00011
	(0.00018)	(0.00018)
Number of children	0.00604	0.00010
	(0.01115)	(0.00953)
Household size	-0.00207	-0.00446
	(0.02592)	(0.02307)
Potential caregiver's education (ref.: none/other)		
ISCED 1/2	0.09212	0.09227*
	(0.05633)	(0.05567)
ISCED 3/4	0.03682	0.07440
	(0.06676)	(0.06270)
ISCED 5/6	0.03907	0.09919
	(0.07749)	(0.07061)
Income (euros)	-0.01915	-0.02560
	(0.02087)	(0.02421)
Wealth (euros)	0.00007	-0.00008
	(0.00008)	(0.00007)
Wealth<0	0.02073	0.05779
	(0.10295)	(0.10210)
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)		
(Self-/)employed	-0.02441	-0.09264

	(0.06757)	(0.06277)
Permanently sick or disabled	-0.08219	0.07954
	(0.09269)	(0.12387)
Charity or voluntary work	-0.16576***	-0.00631
	(0.05206)	(0.04723)
Provides help outside the household	-0.04567	-0.00683
	(0.04356)	(0.03838)
Potential care receiver's physical health	-0.06752***	-0.04718***
	(0.01717)	(0.01758)
Potential care receiver's mental health	0.00328	0.01590**
	(0.00866)	(0.00749)
Potential care receiver's age	0.00504	0.00265
	(0.00356)	(0.00360)
Country (ref.: Austria)		
Germany	0.02927	0.05194
	(0.09398)	(0.09697)
Sweden	-0.01036	-0.02794
	(0.09837)	(0.09696)
Netherlands	-0.00512	-0.13535
	(0.13275)	(0.11920)
Spain	-0.02097	0.07205
	(0.10237)	(0.09957)
Italy	-0.04893	0.01346
	(0.10049)	(0.10326)
France	0.02326	0.01297
	(0.10725)	(0.09838)
Denmark	-0.02889	0.04683
	(0.10621)	(0.10643)
Greece	-0.23369*	0.14547
	(0.14169)	(0.23062)
Switzerland	0.03923	-0.11729
	(0.13975)	(0.11811)
Belgium	-0.06715	0.05731
	(0.09388)	(0.09136)
Israel	-0.26114**	-0.12099
	(0.10379)	(0.09226)
Czech Republic	-0.14924	-0.03470
	(0.12658)	(0.10800)
Poland	-0.20461*	-0.10540
	(0.12287)	(0.12291)
Luxemburg	-0.15543	0.22532
	(0.17742)	(0.17185)
Slovenia	-0.00753	-0.11808
	(0.13949)	(0.13893)
Estonia	-0.22989**	0.03940

	(0.11048)	(0.12215)
Wave (ref.: wave 1)		
Wave 4	-0.00788	-0.04057
	(0.08547)	(0.06739)
Wave 5	0.02206	0.05854
	(0.04359)	(0.04226)
Wave 6	0.03680	-0.02144
	(0.05174)	(0.04700)
Pseudo R-squared	0.184	0.125
Number of observations	1,782	1,562
Number of couples	1,685	1,466

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01.

Table F2. Impacts of spousal informal caregiving on health

	Women		**Men**	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
Informal caregiving (t)	0.08108*	-0.21165*	-0.02397	-0.16665
	(0.04723)	(0.12526)	(0.05627)	(0.12931)
Health shocks since t-1				
Potential care receiver - physical health	-0.13861***	-0.22403	-0.06834	-0.14835
	(0.05338)	(0.13901)	(0.06546)	(0.16292)
Potential care receiver - mental health	-0.02776	0.54870**	0.03681	0.78615***
	(0.07949)	(0.21756)	(0.08755)	(0.17700)
Covariates (t-1)				
Potential caregiver's physical health	0.67758***	0.28314***	0.67197***	0.30602***
	(0.02895)	(0.07082)	(0.03624)	(0.07919)
Potential caregiver's mental health	0.04501***	0.43952***	0.00637	0.44896***
	(0.01200)	(0.03501)	(0.01629)	(0.03786)
Potential caregiver's age	0.02996	0.17189*	-0.05643	-0.11816
	(0.03274)	(0.09768)	(0.04243)	(0.10494)
Potential caregiver's age^2	-0.00033	-0.00122*	0.00026	0.00075
	(0.00024)	(0.00071)	(0.00029)	(0.00071)
Number of children	0.00769	-0.02207	-0.01538	0.06136
	(0.01912)	(0.04564)	(0.02407)	(0.04540)
Household size	-0.00712	0.17169*	0.01596	0.16930*
	(0.03919)	(0.09015)	(0.04346)	(0.10109)
Potential caregiver's education (ref.: none/other)				
ISCED 1/2	0.03826	-0.04050	0.25771	0.30914
	(0.11064)	(0.28256)	(0.19725)	(0.31780)
ISCED 3/4	0.11306	0.01450	0.24790	0.13457
	(0.11517)	(0.30060)	(0.21151)	(0.36104)
ISCED 5/6	0.00446	-0.06821	0.31860	0.42526

	(0.12665)	(0.33289)	(0.21030)	(0.35959)
Income (ln)	0.04682**	0.06167	0.08393*	0.10546
	(0.02176)	(0.06167)	(0.04772)	(0.08919)
Wealth (sqrt)	0.00029***	0.00033	0.00008	-0.00039
	(0.00010)	(0.00028)	(0.00013)	(0.00035)
Wealth<0	0.06512	-0.00365	-0.28603	-0.49385
	(0.14430)	(0.33057)	(0.25642)	(0.50226)
Potential caregiver's employment status (ref.: retired/unemployed/homemaker/other)				
(Self-/)employed	0.10999	-0.00009	0.00883	-0.15475
	(0.07040)	(0.22926)	(0.11517)	(0.27906)
Permanently sick or disabled	-0.25134	-0.25295	0.09056	0.33724
	(0.18325)	(0.35694)	(0.15463)	(0.32417)
Charity or voluntary work	-0.01552	-0.00656	0.13536**	0.23910
	(0.06452)	(0.17196)	(0.06588)	(0.18280)
Potential caregiver provides help outside the household	0.15415***	-0.12549	-0.01796	-0.23563*
	(0.05544)	(0.14380)	(0.06155)	(0.13742)
Potential care receiver's physical health	0.00071	-0.01260	0.01927	-0.07781
	(0.02633)	(0.06587)	(0.03264)	(0.07194)
Potential care receiver's mental health	0.04211***	-0.03135	-0.00201	-0.09845***
	(0.01346)	(0.03760)	(0.01382)	(0.03096)
Potential care receiver's age	0.00141	-0.00432	0.00590	0.00210
	(0.00532)	(0.01287)	(0.00703)	(0.01586)
Country (ref.: Austria)				
Germany	-0.22408*	-0.74273**	0.19627	0.55706*
	(0.12470)	(0.30778)	(0.16377)	(0.29479)
Sweden	0.19529*	-0.55384*	0.18696	0.20053
	(0.11589)	(0.32934)	(0.15113)	(0.33539)
Netherlands	0.15960	-0.87535**	0.57940***	1.38404*
	(0.17753)	(0.44259)	(0.20719)	(0.74898)
Spain	-0.25587*	-1.30696***	0.29448*	-0.15186
	(0.13697)	(0.36612)	(0.16795)	(0.38450)
Italy	-0.10661	-1.25271***	0.13731	-0.45442
	(0.12983)	(0.33551)	(0.16785)	(0.37971)
France	0.10172	-0.57378*	0.17224	0.06338
	(0.12265)	(0.31932)	(0.14291)	(0.33029)
Denmark	-0.06008	-0.63681**	0.08125	0.37425
	(0.12052)	(0.31582)	(0.16501)	(0.35390)
Greece	-0.11498	0.02155	0.34471	1.07752**
	(0.15079)	(0.40374)	(0.24782)	(0.46835)
Switzerland	-0.03040	-0.77131*	0.10980	-0.17551
	(0.20006)	(0.46426)	(0.22180)	(0.46342)
Belgium	-0.06446	-0.55769**	0.31909**	0.18445
	(0.11628)	(0.28244)	(0.14536)	(0.30884)

Israel	-0.56549***	-1.77264***	-0.14141	-0.49831
	(0.16923)	(0.51339)	(0.23144)	(0.41534)
Czech Republic	-0.07273	-0.14811	0.23106	0.52604
	(0.12468)	(0.32616)	(0.15443)	(0.32374)
Poland	-0.21652	-0.89409*	0.17488	-0.45455
	(0.19097)	(0.52583)	(0.30659)	(0.56083)
Luxemburg	-0.77851***	-1.55785**	-0.19216	0.30429
	(0.24462)	(0.68305)	(0.28596)	(0.64426)
Slovenia	0.09685	-0.52172	0.02686	0.17309
	(0.15906)	(0.39861)	(0.32160)	(0.74869)
Estonia	-0.12242	-0.55121	0.10366	0.47698
	(0.15143)	(0.36881)	(0.18539)	(0.42571)
Wave (ref.: wave 1)				
Wave 4	-0.09633	0.12326	0.26386**	0.31848
	(0.12305)	(0.34827)	(0.12421)	(0.30550)
Wave 5	-0.07859	-0.30897*	0.12592	-0.06892
	(0.06730)	(0.17367)	(0.08086)	(0.17287)
Wave 6	0.00474	-0.40612**	0.16254*	-0.03029
	(0.07081)	(0.19899)	(0.08463)	(0.20193)
Constant	-1.93665*	-0.83518	0.57590	8.13258**
	(1.12114)	(3.32557)	(1.55808)	(3.84661)
R-squared	0.599	0.346	0.477	0.298
Number of observations	1,662	1,687	1,693	1,690
Number of couples	1,595	1,620	1,587	1,583

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed.

Appendix G

Table G1. Impacts of formal home care use on health of spouses who suffered a health shock vs. spouses who didn't

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
a) Main results				
Home care use (t)	-0.18092***	-0.22724	-0.06705	-0.30469*
	(0.06861)	(0.15064)	(0.06625)	(0.16192)
R-squared	0.555	0.383	0.531	0.328
Number of observations	1,702	1,735	1,498	1,503
Number of couples	1,609	1,641	1,411	1,412
b1) Potential caregivers who suffered a physical or a mental health shock				
Home care use (t)	-0.12938	-0.06879	0.11966	-0.14211
	(0.10719)	(0.20857)	(0.13161)	(0.25813)
R-squared	0.612	0.472	0.537	0.452
Number of observations	556	555	433	431
Number of couples	548	548	427	426
b2) Potential caregivers who did not suffer any kind of health shock				
Home care use (t)	-0.06664	-0.04095	0.03010	0.00924
	(0.05703)	(0.13094)	(0.05185)	(0.10977)
R-squared	0.743	0.641	0.703	0.609
Number of observations	1,086	1,118	1,017	1,026
Number of couples	1,042	1,073	969	975

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01. Physical health is a standardized index with mean zero and standard deviation one, and mental health is on a scale that goes from zero —very depressed— to 12 —not depressed. Health shocks are defined as drops of at least one standard deviation in the physical/mental health variables between two waves.

Appendix H

H1. Results from sensitivity checks on the empirical specification

Table H1. Sensitivity of the main results to the choice of bandwidth

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
a) Bandwidth = 0.04 (baseline)				
Home care use (t)	-0.18092***	-0.22724	-0.06705	-0.30469*
	(0.06861)	(0.15064)	(0.06625)	(0.16192)
b) Bandwidth = 0.02				
Home care use (t)	-0.18223***	-0.23781	-0.06062	-0.35047**
	(0.06936)	(0.15034)	(0.06651)	(0.16588)
c) Bandwidth = 0.06				
Home care use (t)	-0.17880***	-0.22366	-0.07012	-0.29720*
	(0.06814)	(0.15010)	(0.06614)	(0.16171)

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01.

Table H2. Other sensitivity checks

	Women		Men	
	Physical health (t)	**Mental health (t)**	**Physical health (t)**	**Mental health (t)**
a) Baseline: matching				
Home care use (t)	-0.18092***	-0.22724	-0.06705	-0.30469*
	(0.06861)	(0.15064)	(0.06625)	(0.16192)
R-squared	0.555	0.383	0.531	0.328
Number of observations	1,702	1,735	1,498	1,503
Number of couples	1,609	1,641	1,411	1,412
b) Regression adjustment				
Home care use (t)	-0.14315**	-0.23810	-0.01747	-0.30673*
	(0.06369)	(0.15415)	(0.06423)	(0.16297)
R-squared	0.576	0.347	0.531	0.325
Number of observations	1,702	1,735	1,498	1,503
Number of couples	1,609	1,641	1,411	1,412
c) Exclusion of bottom and top 5% pscores				
Home care use (t)	-0.12187*	-0.31608**	0.05756	-0.31470*
	(0.06536)	(0.15795)	(0.06718)	(0.16754)
R-squared	0.544	0.394	0.502	0.319
Number of observations	1,546	1,578	1,351	1,360
Number of couples	1,462	1,493	1,269	1,273

Standard errors in parentheses are clustered at the couple level. *p<0.1, **p<0.05, ***p<0.01.

H2. Results from falsification tests

To devise a falsification test, we considered health outcomes unlikely to be affected by formal home care use. Among the information available in the dataset, the only health indicator that appears unlikely to be affected by formal home care use, in principle, is whether the individual has cataracts. If we were to find an impact of treatment on this outcome, it might signal something wrong with our approach. We use the same baseline empirical strategy, including a lagged indicator of cataracts among the matching variables, and using probit regression. The estimated marginal effects for women and men are 0.00579 and -0.01073, respectively, with p-values well above 0.1. These compare with sample frequencies of 0.1137 and 0.1059, so we may say that formal home care use does not have an impact on the likelihood of having cataracts, as expected.

The second falsification test is a "pseudo treatment assignment" test, whereby we replace our dummy variable of interest, formal home care use, by a dummy that takes value 1/0 randomly (Bernoulli with probability of success p=0.135/p=0.165, which is the rate of formal home care use among female/male spouses in our sample). We do this 5,000 times. The estimates should be centered around zero, which is what the distributions of the resulting t-statistics in Figures H1-H4 show.

These two falsification tests provide reassurance regarding our baseline approach and results. However and as explored in section 4.5, that approach is potentially subject to some remaining endogeneity, with implications for our conclusions.

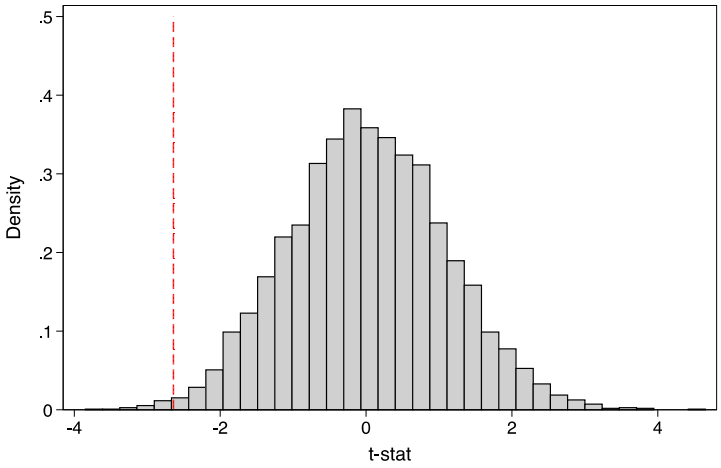

Figure H1. Falsification test: placebo assignment to home care use —women, physical health

Distribution of t-statistics resulting from 5,000 random assignments of home care use to individuals, and t-statistic from actual treatment (red dashed line).

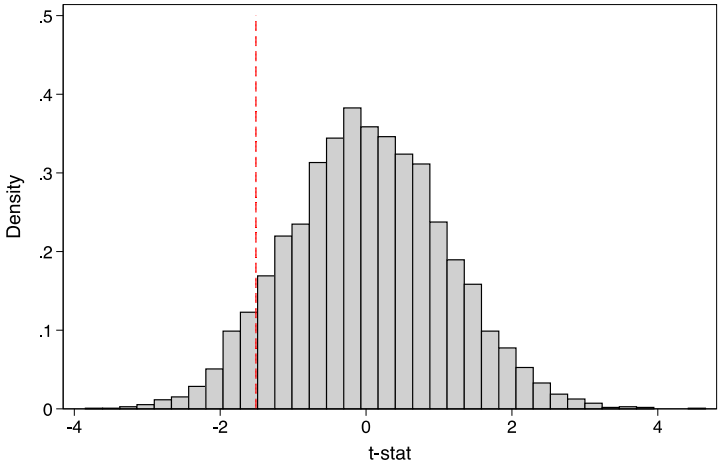

Figure H2. Falsification test: placebo assignment to home care use —women, mental health

Distribution of t-statistics resulting from 5,000 random assignments of home care use to individuals, and t-statistic from actual treatment (red dashed line).

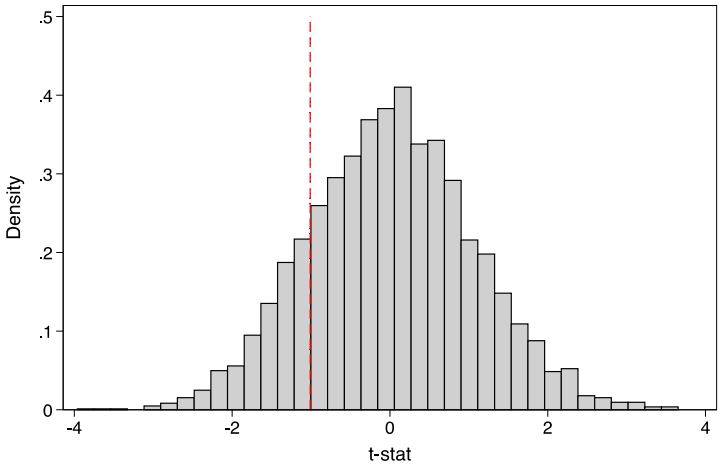

Figure H3. Falsification test: placebo assignment to home care use —men, physical health

Distribution of t-statistics resulting from 5,000 random assignments of home care use to individuals, and t-statistic from actual treatment (red dashed line).

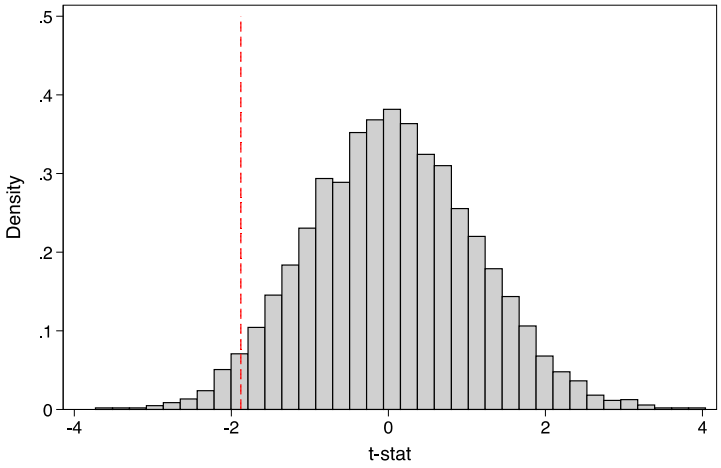

Figure H4. Falsification test: placebo assignment to home care use —men, mental health

Distribution of t-statistics resulting from 5,000 random assignments of home care use to individuals, and t-statistic from actual treatment (red dashed line).

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